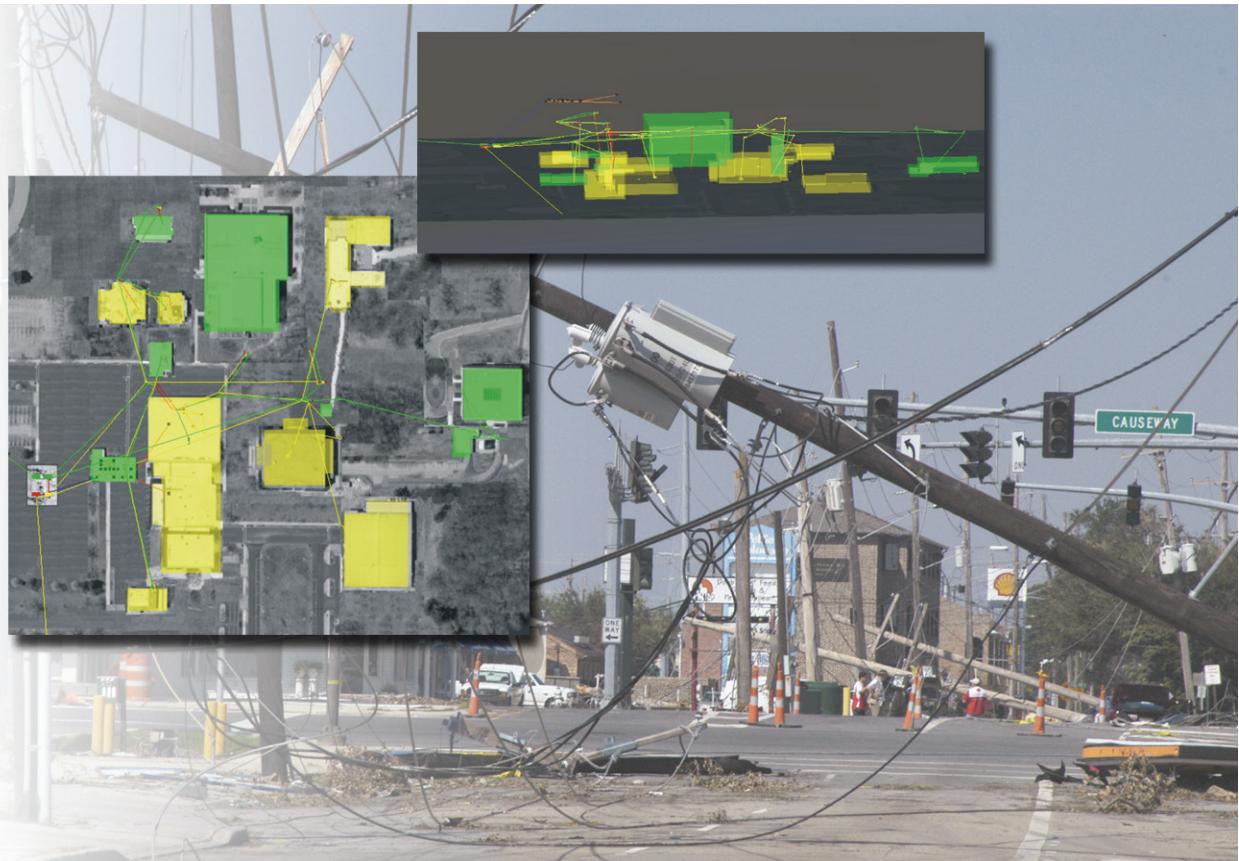


CIMS is a 3D interactive modeling and simulation system designed to identify and evaluate emergent behaviors that result from interdependences between infrastructure components



NATIONAL SECURITY



CIMS[©]: Critical Infrastructure Modeling

Providing Infrastructure owners and decision makers a tool for consequence management and planning.

The Problem

Massive natural disasters and terrorist attacks often have a detrimental impact on public health, safety, and the economy. When a disaster or attack affects the nation's critical infrastructures such as the electric power grid, water treatment facilities, or telecommunication systems, it can hinder response and recovery time, endanger lives, and delay a return to normalcy.

Critical infrastructures are complex physical and cyber-based systems that are essential to the day-to-day functionality of the country. In the last decade, with the

emergence of the Internet and consolidated operating systems, commercial infrastructures have become increasingly automated and interconnected. In fact, most infrastructures are composed of a collection of networks each relying on the other to function properly and provide resources to the public.

For example, control systems networks that operate the electric power grid, including Supervisory Control and Data Acquisition (SCADA) systems provide power to other infrastructure systems such as water treatment facilities. When a deliberate attack, natural disaster, or

accidental system failure occurs at the power plant, it can result in a complete or partial shutdown of multiple infrastructures affecting the state or region.

Crucial to preparing, preventing, and recovering from such an incident requires both private utility and government leaders to understand and visualize the interconnectivity and dependency that each system has on one another. By identifying which infrastructure affects the greatest number of people, utility companies, resource managers, and government agencies

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INL is a U.S. Department of Energy national laboratory operated by Battelle Energy Alliance



can develop a swift strategy of prioritization for returning each infrastructure to an operational state.

INL's Solution

Currently, government and industry owner/operators do not have robust and visual methods, or cyber tools, to identify interdependency weaknesses and vulnerabilities to the critical portions of their infrastructure. In addition, they do not have a visual, modeling tool that assists them in determining which critical infrastructure networks are necessary to perform, or continue, their mission after damage or loss.

To meet this challenge, researchers at Idaho National Laboratory developed the Critical Infrastructure Modeling System, or CIMS© to examine the interrelationships between infrastructure networks. More specifically, CIMS models the emergent system behaviors that develop when one or more nodes within the system are damaged or destroyed.

The complex interconnections and interdependencies of infrastructures represent a highly nonlinear and complex system of systems. While many well defined models and simulations exist for individual infrastructure sectors such as electrical power grid, transportation, and computer networks very few models exist that seek to tie these infrastructures together in a form representa-

tive of their actual implementation. Additionally, many of these models present a physics/engineering-based approach and excel at individual sector analysis, yet they do not necessarily support high level command and control.

CIMSC© takes a systems command level approach seeking to provide decision makers with sufficient information in terms of mission capability without requiring detailed information to support the engineering level.

Often it is enough for a decision maker to understand that electrical power is on or off via the amperage going into a facility. In this way, CIMSC© models and simulates infrastructures and the interdependencies that exist between them at the level appropriate to the situation.

CIMS Key Functionality

At the heart of CIMS is a highly user centric tool that allows decision maker to build models on the fly. It supports rapid model construction from sparse information. For example, utilizing a simple map or aerial photo, one can start construction of an infrastructure model. Information and intelligence data can be added as it becomes available, thus creating an up to date view of dynamic environments such as those after a hurricane or terrorist attack.

External data sources such as web links including web-cam or direct sensor feeds can supplement static data elements.

Specific functionality includes:

- Ability to quickly construct infrastructure models using map images, satellite photos, and other electronic images
- Ability to drill down and extract / change information for individual infrastructure elements
- Graphical (3D) representation of key infrastructure elements and the associated relationships
- Ability to model moving entities (vehicles, plumes, personnel response, etc...)
- Ability to create high fidelity 3D models of infrastructure elements (in 3D Studio Max™)
- Ability to link external data sources including web pages, image data, text files, sensors, external simulations etc...
- Input data files are text files alleviate the need for proprietary database. Likewise data can easily be translated from other sources for input in the model